

# Space News Roundup

Vol. 25 No. 17

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National Aeronautics and Space Administration

## News Briefs

### Deputy nominated

President Reagan has nominated Dale Myers to become the next deputy administrator of NASA, replacing Dr. William Graham, who has been nominated to become director of the White House Office of Science and Technology Policy. Myers is an at-large member of the NASA Advisory Council. From 1979 to 1984, he was President and Chief Operating Officer of Jacobs Engineering Group, Inc. He also served as Under Secretary in the U.S. Department of Energy and, from 1974 to 1977, as vice president for Rockwell International and President of North American Aircraft. "I am delighted that President Reagan has nominated Dale to be the deputy administrator of NASA," said Administrator James Fletcher. "The record shows that he is one of the most capable managers in our industry. The President could not have made a better choice."

### Safety panel chartered

Astronaut Bryan D. O'Connor has been named chairman of the recently chartered NASA Space Flight Safety Panel. The panel will have oversight responsibility for all NASA manned space program activities affecting flight safety. Other members are Larry Bourgeois, a flight director at JSC; Norman Carlson, a test director at Kennedy Space Center; and Harry Craft, a mission manager at Marshall Space Flight Center. The panel will report to the Associate Administrator for Safety, Reliability and Quality Assurance. Panel membership, at a minimum, will continue to include a flown astronaut, a JSC flight director, a KSC launch or test director and a Marshall mission manager.

### Hauck named acting AA

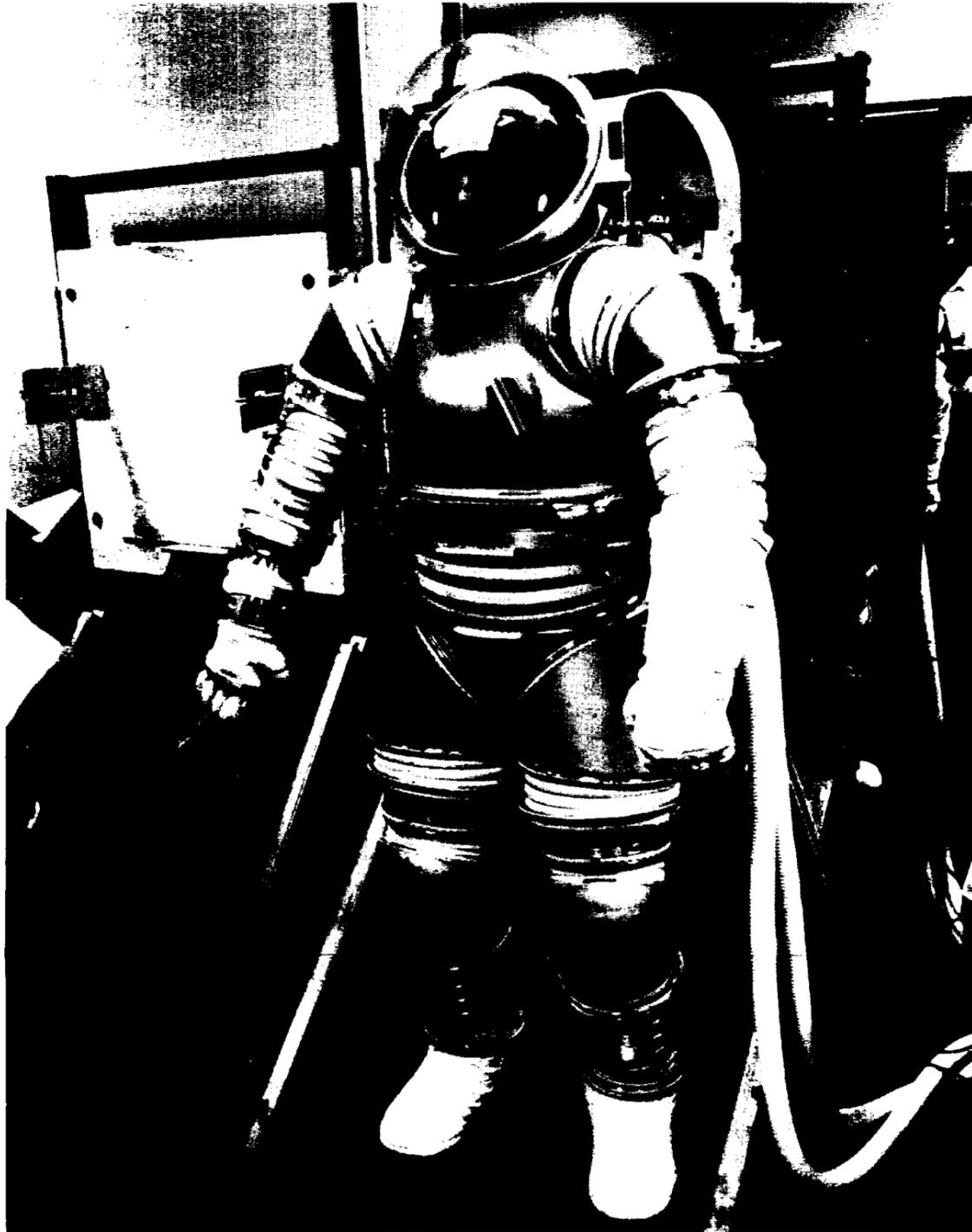
Astronaut Frederick (Rick) Hauck, recently named as Deputy Associate Administrator for External Relations, has now been named Acting Associate Administrator. He succeeds Thomas P. DeCair, who has been appointed Special Assistant to the Associate Administrator for Policy. Hauck's new deputy is Kenneth S. Pedersen. A Navy Captain, Hauck was selected as an astronaut candidate in 1978. He flew on STS-7 and STS 51-A.

### Voyager to have beacon

The around-the-world nonstop flight of the Rutan Voyager aircraft can count on assistance from an international search and rescue system if it runs into problems. The Voyager will carry an emergency international search and rescue beacon similar to the ones which have saved more than 600 lives over the past four years. Four satellites—three from the Soviet Union and one from the United States—are capable of picking up signals from the beacon under the COSPAS/SARSAT program. A lightweight beacon has been provided to the Voyager crew by the Goddard Space Flight Center.

### VAFB tests complete

Full scale tests of the main engine exhaust duct at the Vandenberg Air Force Base Shuttle launch site have been completed by the 6595th Shuttle Test Group. Based on the tests, Air Force officials are considering two ways to address the potential problem of gaseous hydrogen buildup following a main engine abort or flight readiness firing. One solution calls for pumping steam into the exhaust duct to create a mixture which will not support combustion. Another potential fix involves installing a "J" deflector, which would divert the exhaust plume away from the Orbiter and the launch mount, bypassing the entire main engine exhaust duct. A decision on how to proceed is expected to come in December once test results are fully analyzed, the Air Force said.



Astronaut Jerry Ross tries out a prototype of the new generation spacesuit during an evaluation recently. Crew equipment designers are attempting to develop a suit that can operate at 8 psi (instead of 4.3 psi) and eliminate the need for lengthy prebreathes before EVAs. Ross said the prototype is not as comfortable as the current spacesuit. Crew Systems plans further development, with a goal of having a suit ready for WET-F tests by late next year.

## NASA awards SRM contracts

NASA's Marshall Space Flight Center has awarded study contracts to five aerospace firms for conceptual designs of an alternative or Block II Shuttle solid rocket motor.

The 120-day contracts, not to exceed \$500,000 each, were awarded Sept. 3 to Aerojet Strategic Propulsion Company of Sacramento, Calif.; Atlantic Research Corporation of Alexandria, Va.; United Technologies Chemical System Division of San Jose, Calif.; Hercules Aerospace Company's Aerospace Division of Salt Lake City, Utah; and Morton Thiokol, Inc., of Brigham City, Utah, NASA's contractor for solid rocket motors.

The contracts call for each study to provide a conceptual design for a Block II motor, a preliminary development and verification plan for the motor defining how the proposed motor program would be conducted, a capability assessment report defining the resources needed by the contractor to conduct the program, a cost estimate for the program, and production cost of a flight set of Block II motors.

In addition, the contractors will provide conceptual designs for any proposed motor case joints within 60 days. It was a field joint on the current solid rocket motor which caused the STS 51-L failure.

The design concepts for the motor must essentially duplicate the outside geometry of the current Shuttle solid rocket motor and its interfaces with other Shuttle elements. But, with few exceptions, the studies provide the five contractors a free hand to propose a new motor.

The studies will lead to a final product geared to helping determine NASA's long-term policy for Shuttle motors. When the studies are complete NASA will look at the benefits to be gained from the Block II studies, determine how the ongoing solid rocket motor redesign efforts are proceeding, and from that determine NASA's long-term strategy.

## A 50-year project?

### TAU would travel 100 billion miles mapping space

NASA's Jet Propulsion Laboratory (JPL) is studying the possibility of sending a spacecraft billions of miles beyond the planets at speeds of more than a quarter million miles an hour to directly measure the distance to stars in our galaxy and to neighboring galaxies.

The 21st Century project, called TAU for Thousand Astronomical Units, was conceived by JPL Director Dr. Lew Allen. He asked husband and wife astronomers Aden and Marjorie Meinel to organize a team to work on the concept.

An astronomical unit (AU) is the average distance between the Earth and the sun, or 93 million miles. The TAU voyage may signal the beginning of deep space exploration.

The project would use a 50,000 pound, 131 feet long ion (electric) propulsion system to boost the 11,000 pound science spacecraft to about 225,000 mph by the time it is twice the distance of Pluto, about 6 billion miles from Earth.

Astronomy would begin during the voyage past the planets, using

a 1.5 meter telescope. For instance, the spacecraft could return high resolution pictures of Saturn's rings and of the small planet Pluto with its moon Charon. About 10 years after launch, the spacecraft could begin taking measurements of star distances as far away as the center of our galaxy.

One of TAU's astronomical objectives would be to do precision astrometry from a very long baseline, 1,000 AU. But before reaching that distance, TAU will have increased that baseline from the present 2 AU limitation of the Earth's orbit, and therefore, increased the ability to directly measure stellar distances while enroute.

The ability to measure a distance trigonometrically is increased if the measurement is made from two widely separated points. Currently, accurate measurements are limited to about 400 light years with observations from points at opposite sides of Earth's orbit.

The planning for TAU includes the option of viewing the entire solar system as a unit as TAU speeds into deep space. It also would measure the solar magnetic

field and probe the nature of the interstellar plasma during the voyage.

TAU would continue its observations of distances to stars in our galaxy as well as the neighboring galaxies for a period of 50 years, as it travelled through 100 billion miles of space. Not one team, but generations of scientists would work on the TAU project.

TAU's propulsion system would include a nuclear reactor in the megawatt class—larger than any currently used in spacecraft. The propulsion system electrically accelerates a beam of ions—electrically charged atoms—which would be expelled from the engine to produce thrust. The propellant would be solid xenon. The ion thrust would appear as a faint blue beam of light, said Joel Sercel, JPL scientist working on the system.

The ion propulsion can achieve a spacecraft velocity 40 times greater than chemical propulsion which launches the Space Shuttle, he said. But it doesn't do it immediately. The small but continuous engine thrusting would increase the spacecraft's speed to high

velocity. The TAU ion propulsion system would continue to thrust for 10 years, at which time the spacecraft will have sailed beyond the planets.

Once the nuclear fuel is used up, the reactor and propulsion system would be jettisoned and the spacecraft would continue at the same velocity but as a free flyer, slowly rotating about the optical axis of the 1-meter communication telescope. TAU would aim for the limits of the heliosphere—the area of space influenced by the sun.

Its laser communication system could continue to send data back to Earth at 20,000 bits per second. At 1000 AU distance from Earth, the one-way light transmission time would be a week.

A 32.8 foot receiver, called a "light bucket", installed on a space station would intercept the data and relay it to Earth by microwave, or a network of these light buckets distributed at locations around the world would receive the data.

The key to the TAU voyager is three maturing space technologies: a megawatt nuclear reactor power

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## Bulletin Board

### Lunarflins to offer SCUBA course

The JSC SCUBA diving club, the Lunarflins, will offer a six-week basic course beginning Sept. 22. The course will include classroom lectures at the Gilruth Recreation Center and supervised practical experience in the pool. Students who successfully complete the course will be certified by NAUI. Enrollment is limited. The club also schedules regular boat trips to coral reefs, sunken wrecks and platforms in the Gulf, and diving vacations in the Caribbean. Interested persons are invited to attend one of the monthly meetings to learn more about the club. For more information on the class, call the Rec Center at x3594.

### Clinic schedules influenza vaccine

Again this year, the JSC Clinic will be giving influenza vaccine inoculations, according to Charles P. Bergtholdt, Occupational Health Officer. The Center for Disease Control advocates vaccinations for identified risk groups, such as those with heart disease of any type or chronic bronchopulmonary diseases. Those who provide essential services or who merely want to reduce their chances of coming down with the flu this winter are encouraged to consider the inoculation. Adults will require only one dose, Bergtholdt said. Those who receive the vaccine will be asked to sign a consent form and will be given the opportunity to ask questions prior to the inoculation. The vaccine is available in the Clinic, Bldg. 8, from 10 a.m. to noon and from 2 p.m. to 4 p.m.

### Weber to address AFCEA luncheon

USAF Col. Lester J. Weber, Commander of the 2nd Space Wing, Air Force Space Command, will be the guest speaker for the Armed Forces Communications and Electronics Association luncheon at 11:30 a.m. Sept. 23 at the Holiday Inn on NASA Road One. For reservation information, call Sharon Carr at 280-6018 or Jerri Huff at 280-6019.

### Large structures conference planned

The first conference on control/structures interaction technology for large, flexible spacecraft will be held Nov. 18 to 21 at the Omni International Hotel in Norfolk, VA. The conference, sponsored by NASA and the Department of Defense, will include discussions on large space structures technology, selected DOD program reviews and NASA control/structures interaction research topics. For more information, write or call Robert Wright, NASA Langley Research Center, Mail Stop 356, Hampton, VA 23665-5225. The telephone number is FTS 928-4990.

### WaterWorld tickets available from EAA

The Employees Activities Association still has a limited number of discount tickets available for weekend fun at WaterWorld Sept. 27 and 28. The \$5 tickets (a \$5.95 savings) are good for all rides and adventures at the park for the entire day. Tickets are available in the Bldg. 11 Exchange Store from 10 a.m. to 2 p.m., limit 6 tickets per purchase. For more information, call x4814.

### Dickens on the Strand tickets available

Tickets to see the 13th annual Victorian Christmas celebration, Dickens on the Strand, are available from the Employees Activities Association. The tickets are \$3 for adults and \$1 for children and seniors and may be purchased in the Bldg. 11 Exchange Store from 10 a.m. to 2 p.m. The tickets are good for the Dec. 6 and 7 performances, to be held from 10 a.m. to 10 p.m. each day on Galveston's historic Strand between 20th and 25th Streets.

### Goddard Scholarship to be awarded

The National Space Club will award a \$7,500 scholarship for the 1987-88 academic year to a college student interested in a career in aerospace. The scholarship is in memory of rocket pioneer Dr. Robert H. Goddard. The student must be at least a junior in an accredited university pursuing studies in science or engineering. Selection will be based on the student's college transcript; letters of recommendation from faculty; accomplishments which demonstrate creativity and leadership; scholastic plans which would lead to a career in aerospace or a technological field; proven past research and participation in space-related science and engineering; and personal need, although that is not a controlling factor. Applicants should apply by letter before Jan. 16, 1987 to: National Space Club/Goddard Scholarship, 655 15th St. NW, Suite 300, Washington, D.C. 20005. Notification of award will be prior to March 1, 1987.

### NARFE meeting set for Oct. 7

The NASA Area Chapter of the National Association of Retired Federal Employees will hold its next meeting at 1 p.m. Tuesday, Oct. 7 at the Harris County Park Bldg. at 5001 NASA Road One. The guest speaker will be Dr. Pat Koeppel from the University of Texas Medical Branch in Galveston. She will discuss various aspects of preventive medicine. For more information, call Dick Jacobs at 532-1075 or Burney Goodwin at 326-2494.

## Gilruth Center News

Call x3594 for more information

**Exercise** — Come stretch with the gang and feel physically fit. This eight-week session begins Oct. 1 and meets on Mondays and Wednesdays from 5:30 to 6:30 p.m. The cost is \$24 per person.

**Ballroom dance** — This class will teach you the basics of such steps as the rhumba, foxtrot, the cha cha and waltz. Beginners will dance from 8:45 to 9:30 p.m., and intermediates from 8:45 to 9:30 p.m. The advanced class will meet from 7 to 8:15 p.m. Class begins Oct. 2 and runs for 8 weeks, at a cost of \$60 per couple. No individual registration is allowed.

**Defensive driving** — Learn how to drive safely and qualify for a 10% reduction in your insurance. This all day Saturday class meets Oct. 25 from 8 a.m. to 5 p.m. and costs \$20 per person. Space is limited.

**Beginners weight training** — This popular course begins Oct. 7 and runs for four weeks. Class meets on Tuesdays and Thursdays from 7 to 8 p.m. and costs \$20 per person.

**Intercenter run** — It's time once again to represent JSC in this run. It will be held every Monday through Thursday night at 5:15 p.m. during October. Refreshments will be served after each race. Two races, a 10k or 2 mile run, will be held. One Saturday race will be held Oct. 18 at 8 a.m.

**Flag football** — Registration will be accepted starting Oct. 6 for the Wednesday night league, Oct. 7 for Thursday mixed, and Oct. 8 for the Saturday league. Leagues will be limited. First come, first serve basis. Fee structure is determined by the make-up of your team. Choice of nights are Wednesday-men's; Thursday-mixed, and Saturday-men's. For more information, call Helen at x3594. Registration runs from 8 a.m. to 5 p.m.

## Space mapping project

(Continued from page 1)

source, electric ion propulsion and optical laser communications.

TAU would eventually enter the Oort cloud, an area 50,000 to 100,000 AU from the sun where, in theory, the primitive objects left over from formation of the solar system, that could become comets, still orbit the sun, barely tethered by its gravity. The Oort cloud is named for Dutch astronomer Jan Oort who first postulated the theory.

Voyager 1 and 2 also are headed for interstellar space but at only about 36,000 mph. It will take them 20,000 years to travel only 1 light year.

The Oort cloud, or the area near it which Meinel calls OZ for the

Oort zone, could begin as close as 10,000 AU, said Meinel. "There are a lot of questions about the outer solar system we need to answer. Are there a large number of objects in the Oort zone? Where did they originate? Do stars pass by and interfere with the Oort objects, sending them toward the sun and creating comets?" asked Meinel.

The Meinels also suspect that there are still undiscovered stars within the sphere containing the 100 closest stars. They said, "How do we know if a star is close? Are they bright stars far off or faint stars nearby?"

"The known stars are detected only by motion against background distant stars. For this reason stars that are heading toward or away from us remain to be detected.

TAU will do this job well," they said.

Meinel said there is a great deal of enthusiasm for the project. Astronomers are asking if they can do it earlier. Do we have to wait 50 years?

But another question, he said, is will a spacecraft continue to return data for 50 years? A few years ago, no one would have thought so.

"But with the success of Voyagers 1 and 2, now 8 years into an exploration of the planets and still going strong, we think so. The state of the art is far superior now and it will be even more so in the year 2,000 and beyond. We are not horrified at the idea of making electronics that will last for 50 years," the Meinels said.

## Station management changes made

Two management changes were announced at the deputy associate administrator level of the Space Station program at Headquarters Sept. 3.

Dr. Franklin D. Martin has been named Deputy Associate Administrator for Space Station. Former Station Deputy John D. Hodge has accepted the position of Deputy Associate Administrator for Operations.

In his new position, Martin will serve as the deputy for the office responsible for developing the Space Station. As the deputy associate administrator for operations, a newly created position, Hodge will direct agency-wide planning efforts for how the Space Station will be operated when placed in orbit in the mid-1990's.

Previously, Martin was director of Space and Earth Sciences at the Goddard Space Flight Center, Greenbelt, Md., where he was responsible for a broad program of theoretical and experimental scientific research. Martin began his NASA career at Headquarters in 1974 and has served in a variety of positions including manager of advanced programs in Astrophysics, Solar Terrestrial and Lunar

Divisions. He was appointed deputy director, Astrophysics Division in 1978 and served as director from 1979 until February 1983.

Prior to joining NASA, he served as a physicist with the Naval Oceanographic Office and as an aerospace engineer for Lockheed in Houston, Texas, where he was involved in science support of Apollo missions 16 and 17.

A native of China Grove, N.C., Martin attended the University of Tennessee where he received his Ph.D. in physics in 1971. He received A.B. degrees in physics and math from Pfeiffer College in Misenheimer, N.C., in 1966.

Hodge has been the deputy associate administrator for the Office of Space Station since Aug. 1, 1984. Hodge also served as the acting associate administrator for Space Station from December 1985 through August 1986. He was the director of NASA's Space Station Task Force from May 1982 until

named the deputy associate administrator in August. During this time, he directed the initial concept studies for the Space Station that culminated in President Reagan's directive in January 1984 to establish a permanently manned Space Station within a decade.

Hodge previously has served NASA from 1959 to 1970, both at Langley Research Center, Hampton, Va., with the Space Task Group as assistant chief for flight control and then at the Johnson Space Center, Houston, as chief of flight control. He also was a flight director for Mercury, Gemini and Apollo flights. From 1970 until he rejoined NASA in 1977, Hodge was primarily associated with the Department of Transportation, with his final assignment as associate administrator for Policy, Plans and Program Management, Research and Special Programs Administration. Born in Essex, England, Hodge received his B.S. degree in engineering in 1949 from the University of London.

## Cookin' in the Cafeteria

### Week of September 22 — 26, 1986

**Monday** — Chicken Noodle Soup; Wieners & Beans, Round Steak w/Hash Browns, Meatballs & Spaghetti (Special); Okra & Tomatoes, Carrots, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Beef and Barley Soup; Beef Stew, Shrimp Creole, Fried Chicken (Special); Stewed Tomatoes, Mixed Vegetables, Broccoli.

**Wednesday** — Seafood Gumbo; Fried Perch, New England Dinner, Swiss Steak (Special); Italian Green Beans, Cabbage, Carrots.

**Thursday** — Cream of Chicken Soup; Turkey & Dressing, Enchiladas w/Chili, Wieners & Macaroni, Stuffed Bell Pepper (Special); Zucchini Squash, English Peas, Rice.

**Friday** — Seafood Gumbo; Baked Cod, 1/4 Broiled Chicken w/Peach Half, Salisbury Steak (Special); Cauliflower au Gratin, Mixed Vegetables, Buttered Cabbage, Whipped Potatoes.

### Week of September 29 — October 3, 1986

**Monday** — Chicken & Rice Soup; Wieners & Sauerkraut, BBQ Ham Steak, Steak Parmesan, Beef & Macaroni (Special); Green Beans, Carrots, Au Gratin Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Tomato Soup; Potato Baked Chicken, BBQ Spare Ribs, Mexican Dinner (Special); Squash, Broccoli, Ranch Beans, Spanish Rice.

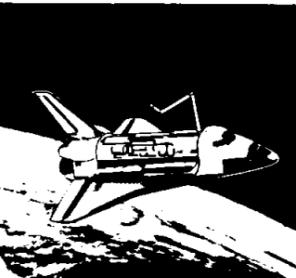
**Wednesday** — Seafood Gumbo; Liver & Onions, Baked Turbot, BBQ Ham Steak, Baked Meatloaf w/Creole Sauce (Special); Beets, Brussels Sprouts, Green Beans, Whipped Potatoes.

**Thursday** — Beef & Barley Soup; Chicken & Dumplings, Corned Beef w/Cabbage, Smothered Steak w/Cornbread Dressing (Special); Spinach, Cabbage, Cauliflower au Gratin, Parsley Potatoes.

**Friday** — Seafood Gumbo; Pork Chop w/Yam Rosette, Creole Baked Cod, Tuna & Salmon Croquette (Special); Brussels Sprouts, Green Beans, Buttered Corn, Whipped Potatoes.

NASA  
Lyndon B. Johnson Space Center

## Space News Roundup



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Editor

Brian Welch

## SSI to use NASA launch facility

NASA and Space Services Inc. of America (SSI), a Houston-based aerospace company, have agreed to general terms on the use of NASA's Wallops Flight Facility, Wallops Island, Va., for the launch of the expendable Conestoga booster.

SSI will reimburse NASA for all direct costs for launch operations support provided by NASA to SSI.

Under the agreement, SSI will be responsible for preparation and launching of the vehicles, including all required non-NASA resources, and NASA will participate as observers to the extent necessary to insure compliance with all range and safety requirements. Overall range control, safety and operation will be the responsibility of the Goddard Space Flight Center, Greenbelt, Md., which controls the Wallops Flight Facility.

In signing the agreement, Isaac T. Gillam IV, Assistant Administrator for the Office of Commercial Programs said, "Here is a clear and early example of NASA's continued support and commitment to the President's commercial space policy."

"With some modification and the construction of a Conestoga gantry at one pad, the Wallops facility is ideal for our type of operation," said Donald K. "Deke" Slayton, President of SSI. "It's an exciting arrangement and we are looking forward to working with the NASA people at both Goddard and Wallops."

First flight of the Conestoga with a commercial payload could come as early as 1987 followed by two to three launches in 1988.

# Meet the ROLMphones

Telephone system will offer new features and capabilities

The future is here.

After more than a quarter century of operation, JSC's telephone system is being replaced, and employees will begin seeing the first tangible evidence of that massive process this month as new instruments begin appearing in offices around the center.

Between now and December, employees will have two phones on their desk—the standard telephone dating back to the early 1960s and the new ROLMphones. There are three different versions of the ROLMphone—the 400, the 240 and the 120. Most employees will receive the 120, which will offer users a number of new features.

Getting used to those features may take some time, and Center Telecommunications System officials will be encouraging employees to experiment with their new phones during the transition period.

The 120 is a single-line telephone that offers one-button access to many commonly used features and phone numbers. It has indicator lights to tell the user at a glance the status of calls, whether they are on hold, busy, being forwarded, or on call waiting.

The ROLMphone 120 has several standard faceplate designs which identify the particular features on a given telephone. These features can vary from phone to phone, depending on the users' needs. As the system goes on line over the coming months, any necessary changes on a particular telephone will be done through software—not hardware—modification.

Functions of the ROLMphone 120 include:

- **Hands Free Dialing**—When the handset is lifted from the cradle, the phone is automatically connected to an outgoing line. After dialing a number, users can depress the LINE button, hang up the phone and the 120's one-way speaker is activated. Users can then lift the handset when the call is answered.

- **Consultation Calling**—During a conversation, a user may need to confer with someone else. By pressing the flash button, the original caller can be placed on hold while another call is made. The user can alternate between the two callers by depressing the CONNECT button.

- **Conference Calls**—A user can add participants to a conference call, one at a time, by pushing the FLASH button and calling another party. Once they answer, the user presses the CONF button. If someone does not answer or isn't able to take part in the call, the user simply presses the CONNECT button and is immediately patched back into the conference call.

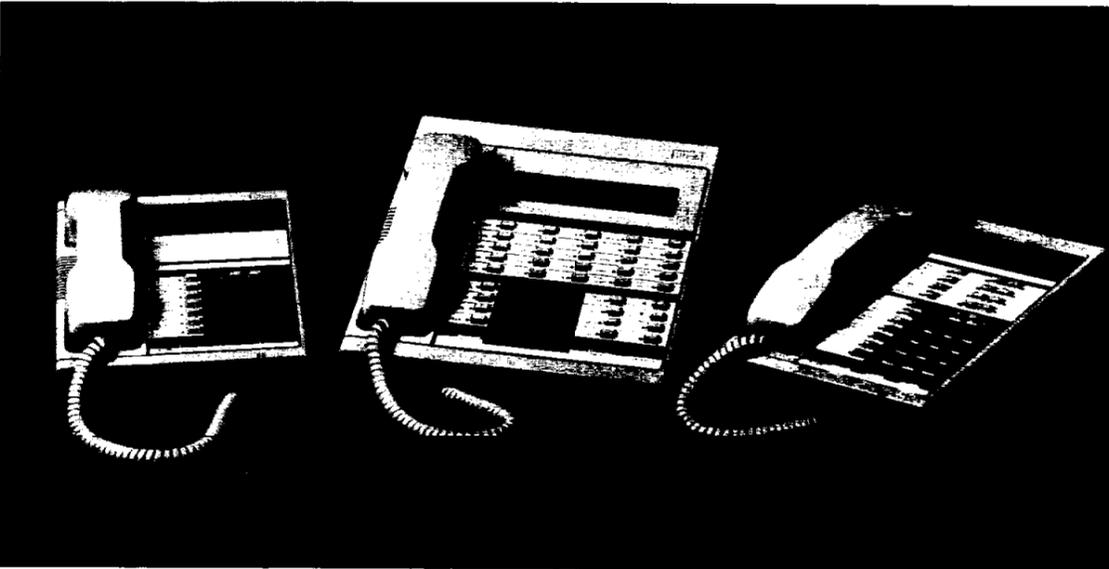
- **Camp-On**—Users will have two different ways to take advantage of the camp-on feature. If a user gets a busy tone after dialing an on-site extension, he can depress the CAMP button and then hang up. When the busy party is free, the user will be called back with two long rings. To cancel the camp-on, the user can depress the CAMP button. Another camp-on method is to allow the busy signal to sound for 10 seconds. At that point, automatic camp-on engages, and the busy party's CALL WTG light will come on.

- **Saving a Number**—The system will be able to save and redial offsite telephone numbers. To save a number that has just been dialed, the user would press SAVE/REPEAT. To dial the number again, he would press the SAVE/REPEAT button once more. The phone will be able to store only one number at a time, but can call that number as often as desired.

- **Call Forwarding**—To forward calls to another office, the user simply presses the FWD button, followed by the 5-digit on-site extension number where the calls should be forwarded. To cancel a forwarding command, the user presses the FWD button from the forwarded extension.



The ROLMphone 120, above, the standard instrument in the new phone system, will be used by most employees. Below, the ROLMphone family features, from left to right, the 120, the 400 and the 240.



## Research shows clouds may offset Greenhouse effect

Preliminary data from NASA's Earth Radiation Budget Experiment (ERBE) suggests that clouds reflect more heat than they retain. Clouds appear to cool Earth's climate, possibly offsetting the atmospheric "greenhouse effect."

The ERBE instruments measure Earth's heat "budget," the amount of sunlight that reaches and is absorbed by Earth and the amount of energy radiation back to space. Even small changes in any component of the budget can have important effects on weather and climate. The instrument's accuracy

in identifying clouds and clear parts of the atmosphere is helping to resolve many scientific questions about the future of Earth's climate.

Scientists have long known that the atmosphere acts as a greenhouse, letting in sunlight and preventing much of the heat from escaping. The greenhouse effect has been expanding for the past 50 years. The problem will increase with the continued use of fossil fuels that release carbon dioxide into the atmosphere, blocking heat from escaping to space.

The anticipated change in the

greenhouse effect caused by increased carbon dioxide is less than about 1 percent. Scientists believe that even this small amount of change will be significant and could be associated with droughts and rising sea levels. However, reliable estimates are not yet possible of how the Earth's climate will be altered by the greenhouse effect.

Winds and ocean currents are another important influence on Earth's climate because they are closely related to the flow of energy from the Sun to the Earth and space. Some scientists think that

changing cloud patterns will alter the energy flow and influence the amount of heat stored in the ocean, thereby modifying the movement of heat from one part of the ocean to another.

Earth's energy budget has been studied for decades with sounding rockets, balloons and satellites. However, the studies have been limited by incomplete coverage and sporadic observations.

ERBE is a three-satellite project that began in October 1984, when ERBS was deployed into orbit from the Shuttle *Challenger*.

A second ERBE instrument package is aboard NOAA-F, a National Oceanic and Atmospheric Administration weather satellite launched into polar orbit in December 1984. A third ERBE package is scheduled to be sent into polar orbit aboard the NOAA-G satellite later this year.

The ERBE instruments measure the average monthly heat budget on regional, zonal and global scales; track the seasonal movement of heat from the tropics to the poles and determine the average daily variation in heat on a 620-mile regional and a monthly scale.

## Station forms operations task force

Carl B. Shelley, manager of JSC's Customer Integration Office, and Dr. Peter T. Lyman, assistant laboratory director, Office of Telecommunications and Data Acquisition, Jet Propulsion Laboratory, Pasadena, Calif., will serve as co-chairmen of an operations task force for the Space Station Program.

The task force will review options and recommend concepts for managing and conducting operations aboard the permanently manned Space Station.

"The Space Station will consist of both unmanned platforms and a manned base," said Andrew J. Stofan, Associate Administrator for Space Station. "With Shelley and Lyman as co-chairmen of the task force, we can capitalize on their vast knowledge of manned and unmanned spaceflight operations from long careers working at NASA centers that are preeminent in the two modes of spaceflight."

At President Reagan's direction, NASA is developing a Space Station which will serve as a permanent facility in space for the conduct of scientific, technology and commercial activities.

International space agencies currently are participating in the preliminary design of the Station and may contribute elements to it as well.

The focus of the task force will be to explore alternative approaches to operating and managing the deployed Space Station, which must integrate a diverse set of U.S. and international hardware elements and accommodate a wide range of manned and unmanned user activities and to recommend an effective concept for operating the system. The task force will report its results and recommendations for operations planning and implementation to the Associate Administrator for Space Station.

## Boeing selected for space commercial development and utilization

NASA has selected Boeing Aerospace Company, Seattle, Wash., for contract negotiations to develop and implement a program to stimulate United States companies to utilize aeronautics and space technology.

"Use of the microgravity environment of spaceflight for research leading to commercial development, production and application of technologies and materials needed on Earth is a key to the Nation's future in the world economic market. Boeing Aerospace Company has been chosen by NASA to help assure that the United States plays a major role in this initiative," said Isaac T. Gillam, NASA Assistant Administrator, Office of Commercial Programs.

The contract is expected to be 1 year in duration with two 1-year options. Estimated contract value will be approximately \$1 million annually. Beginning in October, the work will be carried out by

Boeing Aerospace Operations Company, Cocoa Beach, Fla.

The program's goal is to encourage U.S. firms, with private investment, to join with NASA to explore the application and utilization of new and innovative technologies for the mutual benefit of both parties.

Boeing will be aided by Peat Marwick, Mitchell & Co., New York City, the Nation's largest management and accounting firm. Together, they will establish an office in Washington, D.C., to generate user/NASA agreements and participation through a three-phase approach:

- **Outreach:** Viable U.S. companies will be shown that the use and application of aeronautics and space technology in their firms could lead to more efficient and effective day-to-day operations and increased productivity.

- **Assistance:** Boeing and Peat Marwick will provide the technical

and business services necessary to help commercial users prepare proposals acceptable to NASA.

- **Closure:** The Boeing team will act as an intermediary, familiar with the needs and procedures of both the firm and NASA, to bring about a final NASA/user understanding.

Boeing is committed to being a major user of the Space Station and has entered into an agreement with NASA calling for the firm to fly a series of microgravity experiments aboard the Space Shuttle. These experiments will involve the growth in space of crystals which promise to prove valuable in the production of semiconductor materials.

Both NASA and Boeing consider the proposed Space Station critical to the U.S. commercial space effort. The Space Station, expected to be placed in orbit in the early 1990s, will contain laboratory and research facilities for commercial endeavors.

# Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

## Property & Rentals

Lease: Seabrook 3-2-2 townhome, w/study (or 3rd BR), FPL, fresh paint, quiet neighborhood, avail. now, \$600/mo. Clair R., 488-6808.

Lease: Univ. Green 3-2.5-2 townhouse, nice yard, new carpet/paint, many extras, good locale, pool/tennis, \$695/mo. 474-5079.

Rent: Clear Lake 2-2 condo, month-to-month, fully furnished & equipped. 486-0819.

Sale: Forest Bend 4-2-2, FPL, fenced, game room w/bar and pool table, new hi-eff. AC, low taxes, Clear Creek schools, \$59,000. Glen, x6541 or 486-0462.

Sale: Forest Bend 2 BR townhouse, ex. cond., quiet area, sacrifice price of \$33,000 w/\$1,000 down, best buy. Glen, x6541 or 486-0462.

Sale/lease: Pipers Meadow 3-2-2, contemp., split floor plan, FPL, garden bath, fans, mini blinds, fenced, near pool, \$675/mo. Linda, x3421 or 480-1967.

Lease: Lake Livingston waterfront house, 3-2, fully furnished, pier, ex. fishing, skiing, swimming, weekly & weekly rates. 482-1582.

Sale: Two residential lots in Green Acres off NASA 1, each 114 x 185. 324-4946.

Sale: Forest Bend 3-2.5 townhouse, LR, den, quiet corner, lots of storage, pool, park, \$46,500. 333-2322.

Lease: Pipers Meadow 3-2-2, refrig., stove, FPL, mini blinds, fans, fenced, \$550. Mary Lou, x3274 or 488-3654.

Rent: West Galveston beach house, 3-2, AC, furnished, day/wk./mo. Ed Shumilak, x6575 or 482-7723.

Lease: Baywind II condo, 1-1, FPL, all appliances, pool, game room, etc. Wiltz, x5437 or 944-0451.

Lease: Univ. Green 2-2-2 patio home, split plan, 2 lg. garden baths, ex. cond., detached garage, cath. ceiling, FPL, microwave, drapes, near pool, \$595/mo. 488-0500 or 480-6516.

Sale: Two lakeview lots in Cedar Point on Lake Livingston, util. installed, paved sts., 24-hr. security, 110 ft. frontage, 65 ft. deep. 474-5741.

Lease: Univ. Place townhome, 3-2.5-1/ W/D, refrig., microwave, FPL, avail. now, \$700/mo. David, x4716 or 488-9768.

Lease: Forest Bend 3-2-2, new paint, patio, fan, refrig., fenced, \$525/mo. 482-6609.

Lease: New Orleans time share condo, 1 week during Mardi Gras. Brett, x2245 or x6170.

Lease: CLC 1 BR condo, appliances, FPL, fans, W/D conn., tennis, ex. room, etc., two weeks free, rent applies to purchase option. Jim Briley, x2546 or 488-7901.

Lease: Egret Bay 2-2-2 condo, W/D, fans, FPL, \$425/mo. + \$200 dep. and references. 486-8551.

Rent: Pasadena 3-1-1, large den, refrig., stove, carpet, drapes, fenced, near schools, no pets, \$400/mo. 941-5908.

Sale: Nearly new Heritage Park 3-2-2, ex. cond., \$1,000 equity, assume FHA 10.5%, \$730/mo. Patel, 333-6449 or 996-9628.

Lease: 2 BR condo 10 min. from NASA, pool, tennis, 1 mo. free rent, \$450/mo. + dep. 482-1575.

Rent: Barringer Lane 2 BR apartment, Webster area, W/D conn., fans, mini blinds, \$330/mo. + \$50 dep. 996-8113.

Lease: CLC Baywind II condo, 1 BR, drapes, FPL, all kitchen appl's, util. closet with W/D connections, swim, tennis, \$275/mo. 488-5019 after 6 p.m.

Sale: Custom Friendswood 4-2-2, 15 min. to NASA, near Mall, Clear Creek schools, large fenced yard, high quality woodwork, microwave, fans, walk-ins, looks new, never flooded, high \$50's. Sarma, 333-6556 or 482-9666.

Lease: 1-1 condo on Clear Lake, W/D, FPL, fan, clock thermostat, all appliances, pool & security, \$375/mo. 486-4466.

Lease: 3-2.5 two-story townhome, inside utility room, fenced yard, 2-car covered parking, pool, tennis, etc. \$495/mo. 486-4466.

Sale: King's Row duplex, \$9,500 assumes no approval/no escalation loans, will sell separately 2-2.5-1+1 at \$5,000, make offer. 333-2636.

Lease: Lake Livingston waterfront house, 3-2, sleeps 8, furnished, pier, excellent fishing and water sports, weekend and weekly rates. 482-1582.

Sale: Shoreacres 3-2-2, on 1/2 acre wooded lot, completely fenced, knotty pine kitchen and dining, wood beam ceiling in mast, short walk to bay, boat ramp and pier, \$84,900. Spindel, x4927 or 470-9267.

Sale/lease: Pipers Meadow 3-2-2 contemporary, split floor plan, FPL, garden bath, fans, mini-blinds, fenced, near pool, \$675/mo. Linda, x3421 or 480-1967.

Sale: Chateau Woods 1/4 acre wooded lot, near Woodlands and Oak Ridge North in Montgomery County, \$3,500. Don, x5561 or 486-7380.

Sale: Scarsdale 3-1-5-2, new exterior paint, metal garage doors, fenced yard, greenhouse, fans, other extras, great neighborhood, \$52,400. 481-9579.

Sale: Residential lot in Webster Green Acres, cash price, \$10,000. 324-4946.

Sale: Baywind II 1-1 condo, FPL, mirrored walls, mini-blinds, fans, W/D connections, assumable. 471-6814.

Sale/lease: Nassau Bay 4-2-2, 2,200 SF, new carpet/paint, large garage, deck, atrium, 20' FPL, \$895/mo. or \$119,900. Jerry, x3561 or 474-4310.

Lease: West Galveston Island 3-2 beach house, furnished, day/wk./mo. Ed Shumilak, x6575 or 482-7723.

Sale: Going cruising, must sell all: 2-2.5-2 townhome and all inside; pkge. deal includes waterbed, stereo, furniture, dishes, etc., avail. 15 Oct., \$59,500. Jansen, x3751 or 538-2262.

Lease: Webster 3-3-2, FPL, carpet, fenced, 9.5 EER AC, near schools, pets OK, \$525/mo. plus deposit. 480-5583.

Sale: Bacliff building with shop, office and apartment, great for service business or craftsman. 532-1160.

## Cars & Trucks

'85 Ford Escort GL wagon, AC, tilt, low miles, many extras, ex. cond., \$6,495. 532-1757 or 474-2129.

'78 Toyota Celica GT liftback, 5-spd., AM/FM/cassette, AC, \$2,500 OBO. Mitch, x5378 or 486-0958.

'85 Cadillac Sedan de Ville, burgundy, loaded, unlimited mile warranty, \$13,950 OBO. Gail, 488-4637 or 467-8900.

'84 BMW 318i, 5-spd., AC, sunroof, cruise, leather, sheep skin seat covers, car cover, black on black, 29K mi., 1 owner, assume balance. 332-8103.

'83 Buick Century custom 2-dr., 2.5L, EFI, auto, PS, PB, AM/FM, silver, burgundy in, padded vinyl top, 54K mi., \$5,150. 488-5250.

'74 Maverick 4 dr., 250, auto, PS, cold AC, vinyl top, some rust, excel. work car, \$450 OBO. 471-4100.

'83 Chevy Scottsdale pickup, PS, PB, AC, tilt, cruise, tint, AM/FM stereo, 38K miles, ex. cond. Jeff, x2723 or 470-1556.

'74 VW bus w/'76 engine, twin carb, 9 pass., tint, new front brakes, new clutch cable, AM/FM/8-trk., needs exhaust repair & spare tire, best offer over \$1,000. 532-1961.

'64 Chevy 1/2 ton truck, LWB, 283, 3-spd., factory AC, new front tires, new brakes, needs center driveshaft bearing, \$800. 532-1961.

'77 Ford LTD II, minor problems, AM/FM stereo, good work car, \$500 OBO. 488-2500 or 471-4843.

'72 VW Super Beetle, minor repairs, new tires, good work/school car, \$500 as is. 488-2500 or 471-4843.

'67 Dodge Dart clunker, recently rebuilt engine and trans., needs front end and brake work, driveable, \$300. Samouce, x2255 or 482-0702.

'78 Monte Carlo, loaded, new tires, excel., cond., less than 35K miles, \$2,700. Carol, 370-6818.

'85 Dodge Colt (Mitsubishi), white w/burgundy interior, AC, 4-spd., excel. cond., best offer. 554-4970.

'84 Pontiac Sunbird, bright red, reclin. seats, AM/FM/cassette, cruise, auto trans., fuel injected, digital clock and more, \$4,995. Joy, x3844 or 554-7134.

'80 VW Scirocco, bronze, PB, AC, AM/FM/cassette, \$3,500; '60 Corvair, 4 dr., front body damage, engine needs work, new tires and battery. Mark, x5425 or 486-5581.

'83 Nissan Sentra, yellow, auto, AC, AM/FM/cassette, body, engine and tires in ex. cond., good mileage, \$3,800. Abbey, x3558 or 333-3349.

'76 Ford Pinto, red, auto, PS and AC need work, good body/engine/tires, \$400. Abbey, x3558 or 333-3349.

'77 LTD II, AC, AM/FM/cassette, 84K mi., 351 V-8, auto, cruise, new tires, 4D, good 2nd car, \$1,500. 481-9579.

'85 Chevy S-10 Blazer, \$8,900. 282-4127, leave name and number.

'83 Toyota Celica GT-S, silver/blk. coupe, fuel inj., 5 spd., sunroof, power upgrades, audio upgrades w/cassette & equalizer. Eichinger, 333-6112.

'80 Ford Mustang, brown, low miles, ex. cond., 4 spd. + OD, new tires, \$2,600. John, x2411 or 488-7856.

'84 Pontiac Fiero, red, 4 spd., 17K mi., loaded, new engine, extended warranty, \$6,900. Marie, x3905 or 996-8334.

'59 Chevy Belair, 4 dr., damaged, for restoration or parts. Bill, 482-3005.

'83 Chevy Scottsdale pickup, PS, PB, AC, tilt, cruise, tint, AM/FM, 38K mi., \$6,225. Jeff, x2723 or 470-1556.

'81 Chevy Luv pickup, SWB, AC, AM/FM, \$1,850. Jeff, x2723 or 470-1556.

'81 Ford F-150, supercab, longbed,

blue/white, 70K mi., 4-spd., 300 V-6, PS, PB, AC, AM/FM, needs some body work, \$3,000. Jack, x6230 or 665-6309.

'80 Ford pickup, stepside, 6 cyl, AC, radio, 62K mi., 4 on floor, good cond., \$3,000. Garcia, x6230 or 480-7550.

'81 Thunderbird, mustsell, 997-2079, leave message.

'85 Mitsubishi Starion LE, turbo charged, 5-spd., digital dash, low miles, \$10,500. 532-1160.

'80 Ford Mustang Ghia, 6-cyl., auto, AM/FM, very good cond., \$2,000. Don, 538-1361.

'78 VW Rabbit, beige, 48.8K mi., new tires/brakes, needs starter and battery, \$600. Joan, 282-4727 or 486-0020.

'78 Olds Cutlass Supreme, one owner, ex. cond., \$2,000. Long, x6347 or 481-2174.

## Boats & Planes

'81 Mirage 20' sloop, swing-keel, 2 sails, lights, battery, 5 HP outbd., lots of extras, trailer, \$6,000. Mark, x5425 or 486-5581.

Laser sailboat, good condition, cover and dilly trailer, \$1,100. Anne Gree, x5933 or 326-5843.

Quachita 14' flat bottom boat, \$125 cash. 482-8827.

AMF Trac 18' catamaran, with trailer and extras, like new, \$3,850.

NACRA 17' catamaran 5.2 sailboat, trailer and accessories, \$1,400. Rodney, x4393 or 480-1340, or Walt, x3481.

ROTEC Ralley 2B ultralight airplane, 3-axis controls, \$850. Wayne, x6226 or 486-7141.

Boston Whaler, 13'7", 40HP Evinrude, electric start, sportsman big wheel, galvanized trailer, good tires. Plauche, x6171 or 474-2660.

## Cycles

'79 Honda XL250, very few hours, 4-stroke, 5-spd., garage kept, \$425. Jeff, x2723 or 470-1556.

'79 Suzuki GS 1000L, very good cond., new back tire and brakes, full face helmet, bargain, \$800. Craig, 332-4812.

'86 Nighthawk 450, 6 mos. old, 2K mi., still under warranty, \$1,500. Delores, x3496 or 335-1695.

'79 Yamaha 750 special, great cond., stored last 5 years, low miles, new tires, exhaust, battery, plugs, intakes and grips, completely serviced, \$1,400 OBO. Roger, x6596 or 996-7944.

'84 Honda 250R 3-wheeler, \$1,200. 487-4607.

'85 Honda TRX 125 4-wheeler, electric start, rear rack, like new, \$1,000 OBO. Bob, 280-1599 or 482-7942.

## Audiovisual & Computers

12" Black and White TV, ex. cond., \$25. Patel, 333-6449 or 996-9628.

TI 99/4A computer, program recorder, printer, speech synthesizer and various software, all new in boxes, \$250 OBO. 332-8103.

19" color TV, \$100. Wayne, x6226 or 486-7141.

Radio Shack TRS-80 computer, Model 3, 2 disc drives, monitor, computer table, hundreds of dollars of software, \$495. Tim, x2375 or 486-9318.

Hazeltine terminal, Model 1500, ex. cond., \$250 OBO. Thelma, 282-3809 or 479-0253.

Commodore 64, two 1541 disk drives, color monitor, Seikosha printer, Vic modem, software, \$600 OBO. Richard, x2546 or 946-2806.

Pioneer RT-707 reel-to-reel, auto reverse, Hi-Fi, stereo, 7-inch reel, 15 new Maxell tapes, \$229. John Greer, x4171 or 538-2327.

64K color computer, disk drive, 160K, diskettes, Epson MX-80 printer, cassette, tapes, table, manuals, cables, software, all for \$400. Tom Price, x4576 or 474-3100.

Bearcat 100 handheld scanner, 16 channel, new NICADs, case, AC adapter, \$110. Steve Hester, x7254.

## Household

Bunk bed, \$35; 3 section sofa, \$35; desk chair with wheels, \$50. 482-6609.

Sofa with built in sleeper mattress, green vinyl, \$50. Rodney, x4393 or 480-1340.

Whirlpool mini electric dryer, white, excel. cond., \$200; Whirlpool upright freezer, 16.1 cu. ft., \$225. 538-1126.

Durable, lite-weight velour sofa, 2 matching chairs, like new, must see. Carla, x3301 or x4676 or 554-5075.

Student desk, \$25; swivel rattan chair, \$50; 2 piece L-shape sofa, \$250; queen bed set, headboard & footboard, 5 drawer chest, dresser w/mirror, night stand, \$400. Teresa, x6461 or 487-1883.

Chrome & butcher block dining table, 4 swivel arm chairs, \$180 OBO; dresser w/3 drawers and 2 cabinets, \$38.

Valerie, x2208 or 484-9021.

15 cu. ft. refrigerator/freezer, frost free w/icemaker, excel. cond., \$190. Valerie, x2208 or 484-9021.

Berkline couch and matching recliner, navy blue, one year old, \$700. 480-2367.

JC Penney dining set: 8-side table, glass inlay, brass legs, 4 burnt orange padded chairs w/wicker backs, walnut tones, paid \$750, best offer over \$400, may finance. Greg, 280-1995 or 532-3180.

Dry bar, with pine shelf, chrome footrest, laminated wood top, towel holder, bottle opener, solid construction, \$125. Greg, 280-1995 or 532-3180.

Wood trim leatherette den furniture, 4 pieces, cost \$1,750 new, asking \$500; double bedroom suite, 5 pieces, \$200; walnut credenza, walnut marble topped tables, lamps. Lois, x5309 or 479-7815.

Twin early American maple headboard, \$10. John, x3905 or 482-1501.

Dresser, \$25; twin bed with frame and headboard, \$50; \$700; waterbed, semi-motionless, bookcase and mirror headboard, \$300. 486-9786.

Five piece living room suite, brown tweed, only \$250; double bed mattress and box springs, \$75. 480-5690.

Maytag washing machine, \$100. Bob, x5293 or 480-7610.

Two brown bar stools, wood & velveteen, like new, cost \$375, sell for \$150. Hansen, x2855.

Kenmark fine china service for 8, all serving pieces, never used, \$225 OBO. 333-2636.

Newly upholstered chaise lounge in early American covering, \$195. Claire, 474-4310.

Tappen custom 30" gas range, electric ignition, continuous cleaning, digital clock, white w/woodgrain, 1 yr. old, \$300. Jack, x6230 or 665-6309.

Beta VCR, coffee table, end tables. 997-2079, leave message.

Berkline couch and matching recliner, navy blue, one year old, was \$1,400, asking \$600. 480-2367.

Hamilton Stratosteel 5' drafting table, auto ht., full tilt, tool tray, elec. outlets, bk. shelf, track drafter, parallel bar, ex. cond., \$500. Judy, x3511 or 471-6361.

Approx. 30 sq. yds. of emerald carpet, no pad, ex. cond. 554-7735.

Sofa and love seat, black and white houndstooth, black chaise, all for \$200; upright freezer, 23 cu. ft., coppertone, \$200. 488-5960.

Hot Point microwave oven, LED clock, variable power levels, hardly used, ex. cond., \$200. Robin, x6596 or 586-7188.

Manual typewriter, iron and ironing board, mattress and box spring, wooden work table, bulletin board, desk light, snorkling equipment (like new). Linda, x2411 or 480-3187.

## Lost

Lost: Diamond teardrop shaped pendant on silver chain, last seen at Gilruth Center 9-8-86, great sentimental value. Eileen, x4231.

## Wanted

Want car seats for 9-month-old and for 4-year-old. Dorothy, x2501.

Want to buy electric trains. Don, x2449.

Want to buy LH softball mitt. Pat, x5348 or 486-5278.

Want 3-person dome tent, air mattress, pump. Dave Dunn, x5271.

Want lead trumpet player and percussionist for Contraband Swing Band. Ray, x6327 or 554-5434.

Seeking HAMS interested in emergency service work in Clear Lake area. Dick, KH6FHS, or 486-9786.

Want to buy camping equipment: tent, Coleman stove. Ra'chelle, x6581 or 331-2814.

Want Rockwell Delta 6-inch jointer in repairable condition; 12 or 16 speed floor mounted drill press. Kevin, x4605 or 482-2405.

Want non-working refrigerators, freezers and air conditioners, free removal. Ike, x4920.

## Photographic

Vivatar 75-205mm 1:3.8 telephoto zoom lens, Minolta mount, \$75; Quantaray 28mm 1:2.8 wide angle lens, Minolta mount, \$50. Jimmy, x4866 or 480-0523.

Canon TX camera body, built in light meter, fully manual adjustments, no lens, \$45; Kodak Moviedeck 435 8mm & Super 8 projector, Sears Super 8 Easy-Load movie camera, pistol grip, 3 to 1 zoom, all for \$100. Steve, x6128.

## Pets

Free orange tabby cat to a good home, housetrained, wormed, has shots, great with kids, 1.5 yr. old, litterbox and food

dish included. Roger, x3314 or 480-0638.

Two precious kittens free to good home, available now. Ra'chelle, x6581 or 331-2814.

## Musical Instruments

Upright piano, good condition, \$400. Doug, x3296 or 480-2929.

Trumpet with case, \$110. 488-1665. Fender Mustang guitar with Peavy Backstage amp, \$325. 488-1665.

King cornet, recently reconditioned, looks nice, \$125. Plauche, x6171 or 474-2660.

Fender Stratocaster electric guitar, hard case, 2 yrs. old, excel. cond., \$490 OBO. 538-1126.